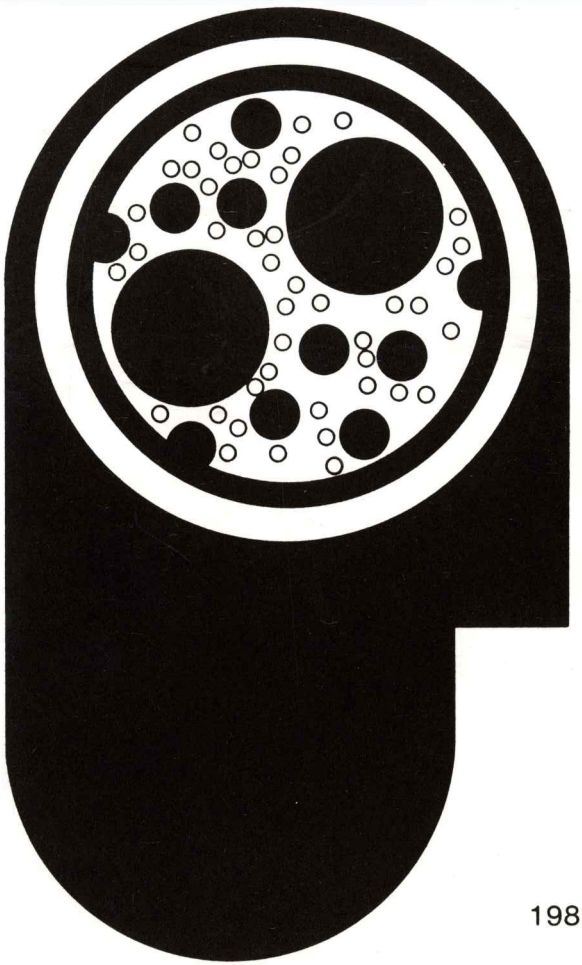
CONCORDIA UNIVERSITY

ARTS AND SCIENCE

DEPARTMENT OF BIOLOGICAL SCIENCES



1981-82

DEPARTMENT OF BIOLOGICAL SCIENCES

LOYOLA AND SIR GEORGE WILLIAMS

CAMPUSES

COURSE GUIDE

1981-82

Information contained herein is subject to change.

The Department:

Staff: There are 22 full-time faculty members in the Biology Department of which 14 are located on the Sir George Williams Campus and 8 on the Loyola Campus. In addition, there are a variable number of part-time lecturers involved in undergraduate teaching. There are 17 support staff (technicians, lab instructors and secretaries) assisting the teaching and research activities.

Facilities: On the Sir George Williams Campus, teaching and research laboratories are primarily located on the 12th floor of the Hall Building. Most faculty members have their own research laboratories and a number of specialized facilities exist including extensive aquatic toxicology laboratories, greenhouses, environmental rooms, sterile transfer areas, isotope laboratory, animal rooms, darkrooms and instrument rooms. On the Loyola Campus, in addition to a variety of teaching laboratories and research laboratories, a number of specialized facilities exist including greenhouse, animal rooms, holding facilities for aquatic fowl, environmental chambers and instrument rooms.

Graduate Programme: There are two M.Sc. programmes available on both a full-time and part-time basis. Option A programme is a traditional research and thesis M.Sc. degree programme with students working under the guidance of faculty members. There are approximately 15-20 students enrolled in this programme at any time. Graduate students are accepted to work in 6 general areas of specialization in the department: Animal Physiology, Aquatic Toxicology, Cell Biology, Microbiology, Ecology and Plant Physiology and Biochemistry. Graduate students contribute considerably in the undergraduate laboratories as demonstrators. In addition, the Option B programme is a course-work M.Sc. degree specifically designed for Biology High School teachers.

Research Activities: Most faculty members in the department are active in research in one or more of the six areas of specialization previously mentioned. Research is well supported by grants and contracts from external agencies and there is a very high rate of publication by faculty members. Research funding allows faculty members to support graduate students, technicans, research associates, post-doctoral fellows as well as purchase scientific equipment. The greatest period of research activity for faculty members is the summer months during which time both the department and individual faculty members traditionally hire some undergraduate students to assist in research projects.

The orientation of research is somewhat different on the two campuses and the undergraduate courses offered at the intermediate and advanced levels reflect this to some degree. The areas of Aquatic Toxicology and Cell-Molecular Biology are concentrated largely on the Sir George Williams campus and Zoology has more emphasis on the Loyola campus. The areas of Animal Physiology, Ecology, Microbiology and Plant Physiology-Biochemistry are strongly represented on both campuses. In the course guide, some indication is given for each course as to whether it is available on both campuses each year, or will be offered for the most part only on one campus. Courses in the latter category are usually specialty courses requiring particcular facilities or instructors.

Research seminars are presented regularly during the term at which guest lecturers, faculty members and graduate students present results of their research to the department. Undergraduates are welcome to attend. The presentation of seminars by students completing Independent Study (490) research projects is a very special event each year and attracts great interest from both staff and students. A Biology students' association exist which aside from providing students representatives to participate at Departmental meetings, is involved in various social and academic activities. The annual Science Week on the Sir George Williams campus involves many biology students in setting up displays. On both campuses a number of social events are organized by

the Students' Association which brings staff and students together on an informal basis.

Career Opportunities:

An undergraduate degree in Biology constitutes the basic preparation for many graduate programmes (M.Sc., Ph.D. in biomedical sciences, M. Ed., M. Lib. Sci., M.B.A.) and professional programmes (Medicine, Dentistry, Vetrinary Medicine, Law).

Graduates at the B.Sc. level may seek employment as technicians and research assistants in government, hospital, industrial and university laboratories. Those wishing to pursue more senior research or supervisory positions normally require graduate degrees.

A number of government agencies traditionally hire Biology graduates including Environment Canada, Provincial Environmental Ministries, Federal and Provincial Forestry, Health and Welfare, Fisheries and Agriculture.

In the private sector, biology graduates have been hired in the pharmaceutical industry, in scientific equipment sales and promotion, in control labs and in environmental consulting firms.

Biology should continue to be a valuable area of concentration in the foreseeable future.

Full-Time Faculty:

Associate Professor and Chairman of the Department:
R.M. Roy, Ph.D. (Toronto)

Professors:
H. Enesco, Ph.D. (Columbia)
R.K. Ibrahim, Ph.D. (McGill)
E.B. Newman, Ph.D. (Radcliffe)

Associate Professors:
P.D. Anderson, Ph.D. (Oregon)
P.J. Albert, Ph.D. (New Brunswick)
S.S. Ashtakala, Ph.D. (Toronto)
C. Beckman, Ph.D. (Rutgers)
R.T. Cronin, Ph.D. (Fordham)
K.S. Dhindsa, Ph.D. (Helsinki)
N.N. Kapoor, Ph.D. (McMaster)
G. Leduc, Ph.D. (Oregon)
E.J. Maly, Ph.D. (Princeton)
C.F. MacLeod, Ph.D. (Minnesota)
B.S. Mangat, Ph.D. (London)
J.D. McLaughlin, Ph.D. (New Brunswick)
S.M. Ruby, Ph.D. (Western)
P. Widden, Ph.D. (Calgary)

Assistant Professors:
R.S. Anderson, Ph.D. (Alberta)
J.A. Kornblatt, Ph.D. (Cincinnati)
M.B. Herrington, Ph.D. (McMaster)
R. Storms, Ph.D. (Alberta)

Information:

The following faculty members serve as undergraduate programme directors who co-ordinate guidance and registration at the departmental level.

Loyola Campus	Fr. R. Cronin	loc. 302 DS 433
Sir George Williams	Dr. C.F. MacLeod	879-4222 H 1225

The main office of the department on each campus is open to students for general questions or to make appointments with faculty members.

Loyola Campus	DA-231 loc. 329
Sir George Williams Campus	H-1225 879-2856

Programmes:

The Biology Department offers a wide variety of courses in botany, zoology, ecology and cell molecular biology. Programmes are designed to give the student a broad background in the biological sciences and to allow specialization and diversification according to the interests of the individual student. Beginning in 1979, a new common programme was implemented on both campuses. The new programme is highly flexible and requires guidance from faculty advisors so that students can take full advantage of the range of options available. The department offers Honours, Specialization, Major and Minor programmes.

Course Numbering

Normally all courses with CEGEP prerequisites or no prerequisites will be 200-level and most commonly taken by students in first year (within 30 credits) or as electives in later years. Those courses with 200-level prerequisites will be 300-level and normally taken by students in second or third year. Likewise those with 300-level prerequisites and/or 400-level co-requisites will be 400-level. Prerequisites to courses can only be waived by obtaining the permission of the instructor and chairman prior to registration. Students in first year may take 300-level courses provided they have prerequisites.

Course Groupings: (subject areas)

Zoology Courses:

C-230 - Animal Biology
C-232 - Entomology I
C-233 - Entomology II
C-234 - Invertebrate Zoology I
C-235 - Invertebrate Zoology II
C-330 - Chordate Anatomy
C-331 - Comparative Vertebrate Anatomy
C-332 - Parasitology
C-333 - Animal Physiology
C-335 - Histology I
C-336 - Histology II
C-337 - Comparative Vertebrate Embryology
C-338 - Invertebrate Zoology
C-339 - General Parasitology
C-431 - Biology of Fishes
C-432 - Microscopical Techniques
C-433 - Neurology
C-434 - Comparative and Environmental Physiology
C-438 - Advanced Topics in Zoology

Botany Courses:

C-240 - Plant Biology
C-242 - Economic Botany
C-246 - Biology of Freshwater and Marine Algae
C-342 - Biology of the Fungi
C-342 - Eastern North American Flora
C-343 - Biology of Non-Vascular Plants
C-345 - Horticultural Science
C-347 - Plant Anatomy
C-348 - Plant Physiology
C-441 - Plant Biochemistry
C-442 - Plant Responses to Environmental Stresses
C-448 - Advanced Topics in Botany

Ecology Courses:

C-250 - Fundamentals of Ecology
C-351 - Field and Laboratory Ecology
C-352 - Plant Field Ecology
C-353 - Intermediate Ecology
C-355 - Fundamentals of Limnology
C-356 - Microbial Ecology
C-450 - Aquatic Ecology and Water Pollution
C-454 - Population Ecology
C-458 - Advanced Topics in Ecology

Cell and Molecular Biology Courses:

C-220 - Introductory Cell Biology
C-260 - Genetics
C-270 - Introductory Microbiology
C-360 - General Genetics
C-361 - Cellular Metabolism I
C-362 - Cellular Metabolism II
C-363 - Genetics of HIgher Organisms
C-364 - Cell Physiology
C-365 - Cytology
C-370 - Intermediate Microbiology
C-460 - Molecular Genetics
C-461 - Advanced Genetics
C-462 - Immunology
C-463 - Developmental Biology
C-464 - Advanced Cell Physiology
C-465 - Biological Regulatory Mechanisms
C-467 - Cytogenetics
C-468 - Advanced Topics in Cell and Molecular Biology
C-470 - Microbial Physiology

Bioelective Courses:
C-222 - Biostatistics I
C-223 - Biostatistics II
C-320 - History of Biology
C-321 - Evolution
C-322 - Biology of Aging
C-380 - Nutrition
C-420 - Radiation Biology and Radiotracer Methodology I
C-421 - Radiation Biology and Radiotracer Methodology II
C- 490 - Independent Study
plus all courses listed under Zoology, Botany, Ecology and Cell and Molecular Biology.

Biology Courses Not Available for Credit to Students in Biology Programmes - intended for students in non-biology programmes.

C-200 - Fundamentals of Human Biology
C-201 - Introductory Biology
C-203 - Fundamental Nutrition
C-205 - Genetics and Human Welfare
C-206 - Elementary Genetics
C-207 - Microorganisms and Man
C-208 - Environmental Biology I
C-209 - Environmental Biology II

Honours in Biology - 72 credits

The Honours Programme is designed for outstanding students who wish to follow a rigorous sequence of courses. Students in the Honours Programme are often preparing themselves for graduate study or professional training and it is in this programme that students are given an opportunity to undertake individual supervised research (Biology C-490). Students in the Honours Programme are required to take:

24 credits (Organic Chemistry[6]*, Biochemistry [6], Biostatistics[3]*, Genetics[3], Independent Study[6]).
6 credits (Animal Physiology[6] or Plant Physiology[6] or Cell Physiology[3] and Advanced Cell Physiology[3]).
36 credits selected from Zoology, Botany, Ecology or Cell and Molecular Biology course groupings (at least 3 credits from each area).
6 credits Bioelectives or additional courses from Zoology, Botany, Ecology, Cell and Molecular Biology groups. Certain courses outside the department may be taken for bioelective credit with permission.
18 credits Electives taken in Biology or outside the department.

In the Honours Programme, students must complete 12 credits in 400-level Biology excluding Independent Study.

Specialization in Biology -60 credits

The Specialization Programme is a more flexible programme than Honours. There are 60 credits of required, and elective biology courses leaving 30 credits which may be taken inside or outside the Biology Department. It would be possible to obtain a 30-credit Minor in another area while following the Specialization programme. While there is no requirement for students to take the research study course (C-490), students with high academic standing in the Specialization Programme are allowed to take this course.

18 credits (Organic Chemistry[6]*, Biochemistry or Cell Metabolism I and II[6], Biostatistics[3]*, Genetics[3]).
6 credits (Animal Physiology[6], or Plant Physiology[6], or Cell Physiology[3] and Advanced Cell Physiology[3]).
30 credits from Zoology, Botany, Ecology, and Cell and Molecular course groups (at least 3 credits from each).
6 credits Bioelectives or additional courses from Zoology, Botany, Ecology or Cell and Molecular courses. Certain courses outside the department may be taken for bioelective credit with permission.
30 credits Electives taken in Biology outside the department.

In Specialization a minimum of 9 credits in 400-level Biology courses must be completed excluding C-490.

*Students who have completed similar courses in CEGEP programmes may request exemptions at the time of admission and, if approved, replace such courses with biology electives.

Major in Biology -36 credits

The Major Programme is frequently taken with students not wishing to specialize exclusively in Biology. This programme is frequently taken simultaneously with another Major Programme (double major).

9 credits (Organic Chemistry[6], Genetics[3]).
6 credits (Biochemistry[6], Cell Metabolism I[3], Cell Metabolism II[3], Cell Physiology[3], Advanced Cell Physiology[3], Biostatistics[3], Animal Physiology[6], or Plant Physiology[6]).
15 credits Selected from Zoology, Botany, Ecology, and Cell and Molecular Biology courses groups (at least 3 credits from each).
6 credits Bioelectives or additional courses from Zoology, Botany, Ecology, Cell and Molecular Biology groups. Certain courses outside the department may be taken for bioelective credit with permission.
54 credits Electives taken in Biology or outside the department.

In the Major Programme students must complete a minimum of 6 credits in 300 or 400-level Biology courses.

Minor in Biology - 24 credits

Students following programmes in other disciplines may wish to take a Minor in Biology. This programme is highly flexible; however, it excludes students from courses intended for non-biology students C-200 to C-209. Non-science students can take a Minor in Biology; however, they must enter the programme with CEGEP Biology 301 or equivalent.

12 credits Selected from Zoology, Botany, Ecology, Cell and Molecular Biology groups.
12 credits Bioelectives or additional courses from Zoology, Botany, Ecology, Cell and Molecular Biology groups. Certain courses outside the department may be taken for bioelective credit with permission.

Selecting Courses: Students should take advantage of faculty counselling and plan ahead at least one year. Since the new programme is much less structured than earlier programmes on both campuses, it is important that students be aware of the prerequisite courses that are required by advanced level courses. For example, Biology C454 requires Biology C353 which in turn requires Biology C250. It is not possible to take all three of these courses in one academic year. In some cases a student may have to take a prerequisite course in the first year in order to take a desired course in the third year because of other prerequisite courses. So planning is necessary to assure an adequate background for the required number of 300 and 400 levels courses.

Students should not assume that all courses will be presented on both campuses each year. Some of our courses may exist primarily or even exclusively on one campus or the other, and some courses may not appear in a given year. This does not apply to required courses. Students are free to select courses in day or evening division. The full range of programmes is available in the evening on the Sir George Williams Campus while introductory and non-biology elective courses will be available in the evening on the Loyola Campus. The magnitude of our teaching operations allows students to complete all programmes on either campus in the day. Many day students find the availability of evening courses an advantage in arranging their schedule.

Students registered in Honours or Specialization programmes usually want to concentrate their studies in Zoology, Cell and Molecular Biology, Ecology or Botany. Within our programmes this can be done. The following paragraphs contain suggestions for sequences of core courses for the different concentrations.

Zoology Concentrations:

Year I: Genetics (C260)[3]
Zoology (C230)[3] or (C238)[6]
Biostatistics I (C222)[3]
Fundamentals of Ecology (C250)[3]
Organic Chemistry (Chem. C221 and C222)[6]
Embryology C237)[3]
Electives 6 or 9 credits

The collective credits should be chosen with a view to the interests of the student. For example a student interested in water pollution and toxicology should select Invertebrate Zoology (C234) above and consider analytical chemistry for the 6 credits of electives. A student interested in vertebrate zoology might select C230 and have 9 credits of electives to select.

Year II: Animal Physiology (C333)[6]
Comparative Vertebrate Anatomy (C331)[6]
Biochemistry (Chem. C371)[6] or (Biol. C361 and C362)[6]
Electives - 12 credits.

The selection of the 12 credits of electives and the selection of the courses for Year III would depend on the interests of the individual student.

Cell and Molecular Biology Concentration:

Students interested in Genetics, Cell Physiology and Chemical activities of Organisms would usually select a sequence of courses in the Cell and Molecular stream.

Year I: Introductory Cell Biology (C220)[3]
Genetics (C260)[3] or (C360)[6]
Biostatistics I (C222)[6]
Microbiology (C270)[3]
Organic Chemistry (Chem. C221 and C222)[6]
Elective - 9 or 12 credits.

Students who have completed CEGEP Biology 401 will be exempted from Biology C220 and will substitute 3 credits of Bioelectives.

Year II: Cytology (C365)[3]
Cell Physiology (C364)[3]
Biochgemistry (Chem. C371)[6]
Electives - 18 credits

Elective credits and courses for the third year should be selected in consultation with a faculty members.

Ecology Concentration:

Year I: Biostatistics I (C222)[3]
Genetics (C260)[3]
Fundamentals of Ecology (C250)[3]
Organic Chemistry (Chem. C221 and C222)[6]
Zoology (C230 or C238)[3]
Botany (C240)[3]
Electives - 9 credits

After the first year a student may develop specific interests so the second and third years, may vary from student to student. The following are suggestions for students with interest in Basic Ecology, Aquatic Ecology or Plant Ecology.

General Ecology:

Year II: Biochemistry (Biol. C361 and C362)[6] or (Chem. C371)[6]
Intermediate Ecology (C353)[3]
Population Ecology (C454)[3]
Organism related courses - 6 credits
Electives - 12 credits

Year III: Field and Laboratory Ecology (C351)[3]
Plant Field Ecology (C352)[3]
400-level Ecology courses - 6 credits
Electives - 18 credits.

Aquatic Ecology:

Year II: Animal or Plant Physiology (C333 or C348)[6]
Biochemistry (Chem. 371 or Biol. C361 and C362)[6]
Intermediate Ecology (C353)[3]
Limnology (C355)[3]
Aquatic Ecology (C450)[3]
Organism-related courses - 3 credits
Electives - 6 credits

Year III: Field and Laboratory Ecology (C351)[3]
Biology of Fishes (C431)[3]
300- or 400-level Ecology courses - 6 credits
Electives - 18 credits

Plant Ecology:

Year I: Students use 3 electives from general first year programme for Introductory Microbiology (C270)[3].

Year II: Intermediate Ecology (C353)[3]
Microbial Ecology (C356)[3]
North American Flora (C342)[3]
Intermediate Microbiology (C370)[3]
Biochemistry (Chem. C371[6] or Biol. C361 and C362)[6]
Organism related course - 3 credits
Electives - 9 credits

Year III: Plant Physiology (C348)[6]
400-level Ecology courses - 9 credits
Electives - 15 credits

Botany Concentration:

Year I: Plant Biology (C240)[3]
Biology of Algae (C246)[3]
Eastern North American Flora (C342)[3]
Economic Botany (C242)[3]
Genetics (C260)[3]
Biostatistics (C222)[3]
Organic Chemistry (C221 and C222)[6]
Electives - 6 credits

Year II: Biochemistry (Chem. C371)[6] or (Biol. C361 and C362)[6]
Plant Anatomy (C346)[3]
Plant Physiology (C347)[6]
Plant Field Ecology (C352)[3]
Biology of the Fungi (C341)[3]
Horticulture Science (C345)[3]
Electives - 6 credits

Year III: Plant Biochemistry (C442)[3]
Plant Responses to Environmental Stresses (C442)[3]
Advances in Botany (C449)[3]
Electives - 21 credits

The foregoing course sequences are only recommended sequences. Individual interests and aims may indicate that other sequences would be preferable.

Helpful Hints:

Course exemptions can be obtained at the time of admission or during the programme for certain courses taken at CEGEP or at other institutions. Discuss this with the admissions office when applying. Students may be granted permission to complete approved courses at other institutions when equivalent courses are unavailable at Concordia.

Normally students will complete no more than 30 credits in the Fall-Winter semester and no more than 12 credits in Summer. One should make every effort to take approximately 15 credits per semester and balance the number of lab sections between semesters. Four lab sections in one semester is an extremely demanding commitment, not only in terms of the lab time but also the preparation and subsequent write-ups.

Students must request permission from the Chairman or Undergraduate Programme Director to take an overload.

Pre-registration takes place every Spring semester for several months. This is an opportunity to discuss your programme calmly with an advisor. It virtually guarantees that you will be able to register for all courses that you want or require. It eliminates the inconvenience of delays, frustration and disappointments of traditional September registration.

January admissions allow students to begin their programme in January. Although some introductory courses are only available in the first semester, there are usually a significant number of courses available in the second semester and in the summer day and evening division to allow students to complete the first year (30 credits) by the following September.

Students have certain flexibility in satisfying the requirement for one 3-credit course in each of Zoology, Botany, Ecology and Cell-Molecular Biology. Zoology requirements can be satisfied by taking any of the following: C230 (Animal Biology), C232 (Entomology), C237 (Embryology) or C234 (Invertebrate Zoology). Note that C230 is commonly required as a prerequisite for advanced level zoology courses.

Botany requirement can be satisfied by taking any of the following: C420 (Plant Biology), or C246 (Algae). Note, however, that only C240 allows one to continue on to 300-level Botany courses (Biology of Fungi, Eastern North American Flora, Biology of Non-Vascular Plants, Horticultural Science, Plant Anatomy, Plant Physiology).

Ecology requirement can be satisfied by taking either C250 (Fundamentals of ecology) or C351 (Plant Field Ecology); the latter (which has C240, Plant Biology as prerequisite. This latter approach restricts continuation in 300-level Ecology courses.

Cell and Molecular Biology requirement can be satisfied by taking any of the following courses: C220, Introductory Cell Biology (for students who have not taken CEGEP Biology 401); C260 (Genetics) in Minor programme (required course in Major, Specialization, Honours); C270 Introductory Microbiology; C364 Cell Physiology, or C365 Cytology for those who have completed CEGEP Biology 401 and have Organic Chemistry prerequisites.

Bioelective requirements can be satisfied by selecting from the Bioelective group or from the other groupings of courses not specifically required in the programme. It is possible to request permission to take courses from other departments which have significant biological content as bioelectives. Consult the Departmental Undergraduate Programme Director or Chairman on this matter.

BIOLOGY C-200
FUNDAMENTALS OF HUMAN BIOLOGY (6 credits)

Instructor: S.P. Drummond or others

Description: This is an introductory course for students who have an interest in human biology. It is not available for Biology students. The course discusses life processes in a non-technical manner, employing lectures, demonstations audio-visual presentations and discussions. The course probes problems not only of organization and functions, but also of health and disease, with a view to a more meaningful life. The fertilized cell is independently capable of developing all the inter-dependent systems of the adult, requiring only food and protection from outside itself.

These systems are considered at various levels: (a) the working unit (b) the support unit (c) the control unit (d) the defense unit (e) the hereditary unit.

The senses - the windows of the mind, and the brain centers - for storage and retrieval of sense data, serve as the basis for intellectual activities.

Each of us can apply the principles, outlined in the course, along the lines of our own interests. Generally, the course should prove useful for those engaged in psychological, sociological, political or economic studies.

Assignments & Grading: To be arranged with the participants in the course.

Prerequisite: None.

Campus: Loyola and Sir George Williams

BIOLOGY C201
GENERAL BIOLOGY (3 credits) Lectures and laboratory

Instructor: R. Cronin, or others

S.G.W. Description: An introduction to biological science, with lectures and laboratory. The course surveys the main areas of biological science with an emphasis on scientific thinking and the logic of experimentation as used in biology.

The course includes 1) survey of cell structure and function, and a discussion of the interaction between nucleus and cytoplasm, 2) topics in animal physiology with a focus on understanding how the main human processes work 3) plant physiology - how do plants earn their living and control their form; 4) an introduction to classical and modern genetics; 5) topics in ecology and evolution.

Similar topics are treated in the laboratory including the dissection of a fetal pig, study of enzymes and of photosynthetic pigments; physiology of paramecium and other organisms.

Loyola Description: This survey course introduces the basic principles of biology, the science of life and of living organisms, their structures, functions and associations. Beginning with the basic chemistry of life in the cell, with its organization and control, the course proceeds through cell associations in tissues, organs and systems as found in the higher plants and animals. The biology of organisms as individuals and in populations and communities are also considered, as well as their origins, evolution, distribution and diversity.

The laboratory, an essential part of the course, introduces the proper use of the microscope and dissection instruments through the study of prepared slide preparations, as well as preserved and living animal plant material.

Assignments & Grading: S.G.W. The accent in exams is on analyzing processes rather than on memorization of names. The grades are determined by lab-work, lab reports and two examinations.
Loyola Students are evaluated on lab assignments, term-test and a final examination.

Prequisite: None

Campus: Sir George Williams and Loyola

BIOLOGY C-203
FUNDAMENTAL NUTRITION (3 credits) Lectures only

Instructor: T.B.A.

Description: This course, intended for students not in Biology programmes, deals with the physiological and biochemical role of major nutrients such as protein, carbohydrate and fat as well as that of vitamins and minerals. Sources of and requirements for these nutrients will be discussed as well as the concept of energy balance. Modification of nutritional requirements throughout the life cycle (infant nutrition, nutrition for elderly), during athletic training, pregnancy, sickness, weight control programmes and vegetarian dietary regimes are considered.

The development of food habits as well as technology of food preparation and preservation are also described. The main objective of the course is to demonstrate why nutrition is important to maintain good health and how to apply it daily for your particular situation.

Assignments & Grading: Students are evaluated on a mid-term and final exam plus an essay.

Prerequisite: None

Campus: S.G.W. and Loyola

BIOLOGY C-205
GENETICS AND HUMAN WELFARE (6 credits) Lectures only

Instructor: D. Peets

Description: This is a course on the principles of heredity as understood by modern biology. It is intended as an introduction and a general survey for non-biology students who may be interested in the ideas of genetics, particularly as they apply to man. The biological basis of social problems is considered at some length.

Assignments & Grading: No formal assignments for written work to be handed in are involved. Students are encouraged to work independently to satisfy personal requirements. Grades are compiled from results of periodic class quizzes and from comprehensive examinations at the end of each term which may be in the form of "take-home" examinations.

Prerequisite: None

Campus: Sir George Williams

BIOLOGY C-206
ELEMENTARY GENETICS (3 credits) Lectures only

Instructor: C.Beckman

Description: This course intended for non-biology students consists of a survey of classical, molecular genetics, and evolution. Some emphasis is placed upon the application of the science to human examples, although the student should expect to learn a considerable amount about other organisms. Sequence of Information: Monohybrid and other organisms crosses - multiple alleles - sex linkage - linkage - tics - bacterial genetics - population genetics - evolution - recent developemts.

The course content changes each year in order to keep up with new developments.

Assignments & Grading: The final grade is based upon three examinations given during the course.

Prerequisite: None

Campus: Loyola

BIOLOGY C-207
MICRO-ORGANISMS AND MAN (3 credits) Lectures only

Instructor: T.B.A.

Description: This course is designed for non-biology students and is intended to provide the student with an elementary understanding of the structure and function of selected viruses, bacteria, protozoa, fungi and algae. The role of these organisms in common human diseases as well as in diseases of agriculturally important plants and animals will be considered. Special problems associated with microorganisms in food production, storage and preservation will be discussed in addition to the utilization of microorganisms in the production of pharmaceuticals and vaccines. Industrial uses of micro-organisms, micro-organisms in sewage treatment and water pollution will be presented.

Assignments & Grading: T.B.A.

Prerequisite: None

Campus: Sir George Williams

BIOLOGY C-208
ENVIRONMENTAL BIOLOGY I (3 credits) Lectures only.

Instructor: T.B.A.

Description: This course considers the various components, living and non-living of undisturbed natural areas and their interactions. We will see that substances essential for surval (nutrients) are continuously recycled through the death and decay of organisms and that these processes require energy. All the while, a certain stability appears to be maintained in the environment. The idea of "balance of nature" will be discussed.

The ways in which environmental factors control the numbers and distribution of different plants and animals will be studied; an attempt will be made to find out whether or not these numbers remain approximately constant in undisturbed areas. Some of the properties of communities of different species will be considered and hypotheses to explain why the numbers of species vary from one part of the globe to another will be put forth.

We will see how ecosystems can evolve, reaching a mature, self-perpetuating state. We will consider in detail the rate of production of living matter, a characteristic of ecosystems which is of particular interest to man.

Assignments & Grading: Term test(s) and final examination.

Prerequisite: None

Campus: Loyola and Sir George Williams

BIOLOGY C-209
ENVIRONMENTAL BIOLOGY II (3 credits) Lecture only.

Instructor: T.B.A.

Description: Biology C209 is concerned with man, with his activities and with the effects of those activities on the natural world. It considers how man's specific means of adaptation to the environment make his impact different from that of other animals.

The effects of one of his most important activities, food production will be studied in depth. Also included is material on the environmental impact of energy production, which enables man to increase his level of activity in all other fields, and on various forms of pollution which result from this increase; of interest will be the response of other life forms to these disturbances and, in particular, the question of species extinction which, because of its importance, will be dealt with in a separate section. Finally, the possible future impact of man's present activities as well as the possible effects of pollution control measures on our life will be considered.

Assignments & Grading: Term test and final examinaion.

Prerequisite: None.

Campus: Loyola

BIOLOGY C220
INTRODUCTORY CELL BIOLOGY (3 credits) Lectures and laboratory

Instructor: R. Roy or others

Description: An introductory level cell biology course in which the following are covered: origin of life, biological molecules, cell structure and ultrastructure, cell division, DNA, protein synthesis, elementary metabolism and bioenergetics, elementary cell physiology and genetics.

Laboratory exercises and the analysis of results in lab reports constitute an important aspect of the course.

Assignments & Grading: Final grades are based upon a term test, lab reports and a final examination.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Williams and Loyola

BIOLOGY C-230
ANIMAL BIOLOGY (3 credits) Lectures and laboratory.

Instructors: P.J. Albert, N.N. Kapoor, C.F. MacLeod or S.M. Ruby

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Description: The course will deal with a basic study of the morphology and physiology of a selected series of invertebrate and vertebrate animals, stressing the diversity among animals and the means by which animal groups meet the environmental demands of the habitat in which they live.

Structure, function, behaviour and integration of organ systems will be studied with emphasis placed on evolutionary trends within the major animal phyla.

This course will provide the necessary background for students interested in pursuing some of the specialized higher-level zoology courses.

Assignments & Grading:

Lecture material:	60%	(term test(s) and final exam)
Lab material:	40%	(reports and/or lab practical exam).

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Loyola and Sir George Williams

BIOLOGY C232
ENTOMOLOGY I (3 credits) Lectures and laboratory

Instructor: P.J. Albert

Decsription: An introduction to the study of insects. Basic classification is followed by morphology, anatomy, and some physiology. Topics will be discussed as follows:

Introduction:
Classification: Protura, Thysaneura, Diplura, Collembola, Embioptera, Plecoptera, Psocoptera, Dermaptera, Embioptera, Plecoptera, Psocoptera, Zoraptera, Mallophaga, Anoplura, Thysanoptera, Hemiptera, Homoptera, Coleoptera, Strepsiptera, Mecoptera, Neuroptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera, Hymenoptera.

Morphology:
Outer covering, cuticle, external processes of body wall segmentation. Insect head, types, antennae, mouthparts and modifications. Thorax, legs, wings, locomotion. Abdomen, reproductive appendages.

Insect metamorphosis - types.

Anatomy:
Alimentary canal, excretory and circulatory systems, reproductive kand central nervous systems, sensory systems.

Insect ecology and control will be discussed and followed by a summary and review of the course.

Laboratory sessions will deal with morphology, anatomy and classification. They will begin with a field trip, the object of which will be to observe and collect various insects.

Each student will hand in a collection of 15 different insect species, identified and labelled.

Assignments & Grading:

Insect Collection	15%
Lab exam	25%
Midterm exam	10%
Final exam	50%

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Loyola

BIOLOGY C233
ENTOMOLOGY II (3 credits) Lectures and Laboratory

Instructor: P.J. Albert

Description: This course deals with insect physiology and behaviour. It emphasizes the relationships between structure and function of various insect parts. The lecture topics will include the following: Introduction to insect behaviour, vision, gustation, olfaction, pheromones, hormones ligh production, sound production and perception, social behaviour, diapause, migration and insect control.

Laboratories will involve the use of live insects to study various physiological and behavioural mechanisms.

Assignments & Grading: The final grade will be a combination of marks from the following: midterm test, seminar, lab reports, final exam. The values for each of these will be determined at the first lecture.

Prerequisite: Entomology I (Biology C-232)

Campus: Loyola

BIOLOGY C-234
INVERTEBRATE ZOOLOGY I (3 credits) Lectures and Laboratory

Instructor: D. McLaughlin

Description: The course involves a detailed examination of the lower (non-coelomate) invertebrate. Lectures will cover morphology, physiology, phylogeny and evolution in Rotifera and Nematoda. Stress will be placed on the physical and physiological adaptations of each group to their respective environments.

Laboratory work will concentrate on the morphology and life histories of groups examined during the lecture period. Where possible live material will be used to demonstrate various physiological and behavioral aspects of selected species.

Assignments & Grading: The final mark will be based on a mid-term exam and a final exam accounting for approximately 70% of the final mark and a final laboratory exam worth approximately 30%.

Prerequisite: CEGEP Biology 301

Campus: Loyola.

BIOLOGY C-235
INVERTEBRATE ZOOLOGY II (3 credits) Lectures and laboratory.

Instructor: D. McLaughlin

Description: This course is designed to follow Biology C234 and has minimal overlap with General Zoology. The subject matter deals with the coelomate invertebrates; i.e. the Annelids, Molluscs, Arthropods (excluding insects), Echinoderms and if time permits, other minor groups. Lectures will cover morphology, some physiology and adaptive radiation in the various groups.

Laboratory work will concentrate on the morphology of selected representatives and will be based largely on dissections. Where possible, living specimens will be used to illustrate the mechanics of locomotion, filter feeding, etc.

Assignments & Grading: The final mark will be based on a mid-term and on a final exam accounting for approximately 70% of the final mark, and a final lab exam worth approximately 30%.

Prerequisite: Biology C234 or Biology C230.

Campus: Loyola

NOTE: The prerequisites listed in the 1981-81 University calendar and schedule are in error.

BIOLOGY C-237
VERTEBRATE EMBRYOLOGY (3 credits) Lectures and laboratory.

Instructor: P. Anderson

Description: This course focuses on the transition in form and function of vertebrate organisms during ontogeny. Explanations for the mechanisms of sequential differentiation, and the patterns of growth and form are sought at the cellular and subcellular levels of biological organization. Specific topics include gametogenesis, fertilization, morphogenesis, embryonic induction, extraembryonic membrane structure and function and the physiology of reproduction.

Laboratory assignments concentrate on developing a student's ability to appreciate the spatial and temporal aspects of vertebrate morphogenesis. The transition of embryonic tissues into adult organ structures is followed in amphibians, birds and mammals. Some experimental studies with frog and chick development are included. Placental structures are examined.

Assignments & Grading: Theory exams, based on preassigned essay questions are held at mid and end of term. There is also a final laboratory examination. The grading scheme is determined in consultation with students.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Williams

Text: Foundations of Animal Development, by Hopper and Hart, Oxford University Press, 1980.

BIOLOGY C240
PLANT BIOLOGY (3 credits) Lectures and Laboratory

Instructor: S. Ashtakala, R.K. Ibrahim or B. Mangat

Description: An introductory lecture and laboratory course designed to acquaint students with the biology of plants. The course emphasizes the following areas:
- Structure of the plant cell and its organelles; types of permanent cells and tissues; their distribution and function.
- Morphology of roots, stems and leaves; their adaptations to different ecological habitats and their modifications. Flower structure, reproduction and types of fruits.
- Distribution of tissues in different organs of the plant in relation to the physiological role(s) of each organ.
- A study of the physiological processes of plants including water relations, transpiration, respiration, photosynthesis and translocation.
- Physiology of plant growth with emphasis on the role of phytohormones in regulating plant growth and development.
- A large portion of this course deals with diversity of form in the plant kingdom as represented by examples from the algae, fungi, bryophytes, ferns and seed plants; their life-cycles and their ecological/economic significance are emphasized.

Assignments & Grading: The final grade will be distributed among the following:
- Weekly laboratory reports and laboratory tests.
- Mid-term exam (or class tests).
- Final written examination.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Willams and Loyola

BIOLOGY C242
ECONOMIC BOTANY (3 credits) Lectures only

Instructor: T.B.A.

Description: This course concerns plants of economic importance to man. It is designed to alert the student to the different food requirements and resources around the world, as well as to the changing role of plants in medicine, clothing and shelter. Emphasis concentrates on food plants, their origin, development, processing and use. Demonstration material in class introduces the student to the visual, tactile and taste properties of plant forms and products not generally recognized. Films illustrate a variety of techniques used to produce the plants and their transportation to the market. Visits to the Montreal Botanical Gardens and local related industries are planned - schedule permitting.

Assignments & Grading: A term-paper gives the student an opportunity to explore a specific plant or group of plants in greater detail. Mid-term and final examinations, together with overall participation, contribute to student evaluation.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Williams

BIOLOGY C-246
BIOLOGY OF ALGAE (3 credits) Lectures and Laboratory.

Instructor: S.S. Ashtakala

Description: A study of the morphological, physiological, and ecological diversity of algae with emphasis on the distinguishing characteristics of each major group. Topics include the commercial and industrial uses of algae, the use of algae as pollution indicators and the influence of algae on the environment. Laboratories are designed to enable the student to collect, identify and quantify algae specimens from fresh water ecosystems. The physiology of representative cultured algae will also be examined.

Assignments & Grading:

Lab reports and projects	20%
Mid-term Examination	20%
Final Examination	60%

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Williams

BIOLOGY C-250
FUNDAMENALS OF ECOLOGY (3 credits) Lectures only.

Instructor: E. Maly, G. Leduc, or P. Widden

Description: An introduction to the basic principles of ecology. This course illustrates how environmental factors determine distribution and abundance of plants and animals in different ecosystems.

Topics discussed include the abiotic environment (water, air, climate, soil), production and community energetics, community structure, nutrient cycling, single species population characteristics and population regulation, competition, predation. Representative habitats such as forest, tundra, deserts, grasslands, lakes and streams, the ocean coast are studied to illustrate special adaptations.

This course serves to introduce the basic concepts in ecology and is prerequisite for most other ecology courses. In addition to teaching basic concepts, the course is designed to outline practical implications of ecology.

Assignments & Grading: Mid-term test and final examination.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Williams and Loyola

BIOLOGY C-260
GENETICS (3 credits) Lectures and Laboratory.

Instructor: C. Beckman, M. Herrington or others.

Description: A course to illustrate the fundamental principles of inheritance in plants, animals and microorganisms. Mitosis meiosis, genetics, gene linkage and mutation will be covered. The role of DNA as the hereditary material and genetic code will be studied in detail, as will the mechanisms of DNA, RNA and protein synthesis. There is also an introduction to bacterial genetics and to population genetics.

Assignments & Grading: Examinations will test the problem-solving ability of the student with respect to exercises in Mendelian, introductory molecular and population genetics. Regular laboratory reports are required.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Loyola and Sir George Williams

BIOLOGY C-270
INTRODUCTORY MICROBIOLOGY (3 credits) Lectures and Laboratory.

Instructor: R.J. Germinario, M.B. Herrington, S. Sehgal or R. Storms

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Description: An introduction to theoretical and applied aspects of microbiology. The topics covered include the fine structure of the bacterial cell, staining characteristics of microorganisms, kinetics of growth of bacteria, environmental factors affecting bacterial growth, nature and mechanism of action of antibiotics, and structure and reproduction of viruses. In addition, information on the relationships of bacteria and viruses to industry, health, agriculture and ecology is presented.

The laboratory exercises introduce methods of handling microorganisms and will illustrate the lecture material.

Assignments & Grading: Final grades will be based on a combination of term-papers, lab reports and examinations covering both lecture and laboratory material.

Prerequisite: CEGEP Biology 301 or equivalent.

Campus: Sir George Williams and Loyola

BIOLOGY C-320
HISTORY OF BIOLOGY (3 credits) Lectures only

Instructor: D. Peets

Description: The objectives of this course are to provide a historical background for, and an overview of, present biological ideas and the persons who were instrumental in developing them; and to help students to familiarize themselves with independent study habits by working on selected topics from the history of biology. After a few introductory lectures, class sessions will consist of seminars presented by students, and discussion of the ideas of the seminars.

Assignments & Grading: There are no formal examinations. Each student is required to present a seminar on a chosen topic and to submit a term-paper on a different selected topic. Grades will be compiled from these and from participation in class discussions.

Prerequisite: Any 12 credits in biology.

Campus: Sir George Williams

BIOLOGY C-321
EVOLUTION (3 credits) Lectures only.

Instructor: D. Peets

Description: The course objective is to examine the biological basis for the development of the ideas of organic evolution from Darwin's principles to the modern synthesis as understood by biologists today.

Assignments & Grading: Each student is required to present a seminar on a selected topic related to evolution, and to submit a term-paper on a different subject. Grades will be assessed on the basis of the seminar, the term-paper and class participation. There are no formal examinations.

Prerequisite: Any 12 credits in biology.

Campus: Sir George Williams

BIOLOGY C-323
BIOLOGY OF AGING (3 credits) Lectures only.

Instructor: H. Enesco

Description: In this course we will ask many questions: What are the differences between organisms which age and those which do not? What physiological changes take place in aging? Has there been selection for or against aging in the course of evolution? What are the cellular changes which take place in aging? Does aging change cell division potential?

With this background, we will examine what factors may influence lifespan, such as diet, exercise, chemicals. We will then proceed to examine some of the many theories which have been put forward to explain aging: the rate of living theory, the error catastrophe theory, the autoimmune theory of aging, and the cell clock hypothesis. We will examine the extent to which molecular repair capability affect aging. We will also examine the role of the nervous system in aging.

Assignments & Grading: Short term-papers are required. Seminars may be required.

Prerequisite: Biology C-260.

Campus: Sir George Williams

BIOLOGY C331
COMPARATIVE VERTEBRATE ANATOMY (6 credits) Lectures and Laboratory.

Instructor: K.S. Dhindsa or C.F. MacLeod

Description: A comprehensive study of the anatomy, development and evolution of vertebrate systems, from the lower chordates through the Agnathas, fishes, amphibians and the reptiles to the birds and mammals. Comparative anatomical changes are correlated with the adaptive radiation, evolutionary trends and biological/ecological systems of chordates. The lectures begin with an introduction of the nature, principles, domain of comparative anatomy and vertebrate pedigree. The comparative study of the vertebrate organ systems, for the various groups discussed are: integument and its derivatives, supporting tissue and the skeleton, muscles, body cavities, respiratory structures, alimentary systems, excretory and reproductive systems, circulatory systems, sense organs, nervous system, endocrine glands.

The laboratories involve extensive morphological study and general survey of the major groups of chordates. Comparative study of the vertebrate systems through dissections (molgula, lamprey, shark, turtle, pigeon and the cat), series of skeletons, prepared slides, preserved and mounted dissected specimens.

Assignments & Grading: Grades are compiled from the results of periodic quizzes, laboratory reports and demonstrations plus mid-term and final laboratory and theory examinations, as follows:

Quizzes:	20%
Laboratory:	30%
Mid-term:	10%
Finald (Lab & Theory)	40%

Prerequisite: Biology C230 or C237 or C234.

Campus: Sir George Williams and Loyola

BIOLOGY C332
PARASITOLOGY (3 credits) Lectures and Laboratory

Instructor: M. MacLeod

Description: The course will give some insight into the scope of Parasitology. A representative sample of parasites from the following Phyla will be studied with special reference to the parasites of man: Protozoa (Sarcodina, Sporozoa, Flagellata and Ciliata), Nematoda and Acanthacephala along with a brief look at the Arthropoda. Lecture material will be supplemented in the laboratory by the study of prepared slides. Students will also have an opportunity to study the phenomenon of parasitism by carrying out a systematic parasitological examination (necropsy) of a frog. Parasites recovered will provide material for staining and mounting technique.

Assignments & Grading: Term test, final exam and final lab exam.

Prerequisite: Biology C230 or C234 previously or concurrently.

Campus: Sir George Williams

BIOLOGY C-333
ANIMAL PHYSIOLOGY (6 credits) Lectures and Laboratory.

Instructor: N.N. Kapoor or P.D. Anderson

Description: A study of the mechanisms by which the activities of major organ systems are co-ordinated and regulated for the survival of animals, particularly, vertebrates. Some basic physiological phenomena related to the organ system activities are discussed.

The laboratories are designed to develop a student's awareness of quantitative approaches in physiology and to introduce students to some simple surgical techniques and basic instrumentation. Various laboratory exercises, demonstrations and projects relate to system physiology in animals. Students are encouraged to gain information from various sources. Some laboratories may include student's participation in seminars.

Assignments & Grading: Laboratories are important and form an integral part of the course. A good lab report is expected. Laboratory assignments may also include seminars. Examination question papers include material covered in lectures, assigned readings and laboratories. Examination format may be either multiple choice, short answer, essay type or a combinaion thereof. Grades are based on lab reports mid-term and final examina.

Prerequisite: Biology C230 or Biology C237 and Chemistry C221 and C222 (Organic Chemistry).

Campus: Loyola and Sir George Williams

BIOLOGY C335
HISTOLOGY I (3 credits) Lectures and Laboratory.

Instructor: S.M. Ruby or K.S. Dhindsa

Description: This course consists of a microscopic study of the organization into basic tissue types. The histology of tissues will be examined at the ultrastructural, histochemical and physiological levels and these features will be related to the functioning of the various tissue forms. Epithelium, connective tissues, including areolar, adipose, reticular, elastic tissue, cartilage and bone, muscle, nervous and vascular connective tissue will be studied in depth and the student will be introduced to the basic concept of organization of tissues into organs and organ systems.

Assignments & Grading: Periodic laboratory quizzes and reports will be required, along with a final written and laboratory examination.

Prerequisite: Biology C230 or Biology C237 or Biology C234; Biology C330 or Biology C331.

Campus: Loyola and Sir George Williams

BIOLOGY C336
HISTOLOGY II (3 credits) Lectures and Laboratory.

Instructor: S.M. Ruby or K.S. Dhindsa

Description: This course deals with the organization of the basic tissues into organs and organ systems. It will include the following systems: digestive system and associated glands (liver, pancreas and salivary glands), respiratory, excretory, endocrine, reproductive and haemopoietic systems. The functioning of these systems in relation to these histological structures will be stressed. Wherever possible the comparative aspects of various organs throughout the vertebrates will be examined.

Assignments & Grading: Periodic laboratory quizzes and reports will be required along with a final written and laboratory examination.

Prerequisite: Biology C335

Campus: Sir George Williams and Loyola

BIOLOGY C-337
COMPARATIVE VERTEBRATE EMBRYOLOGY (6 credits) Lectures and Laboratory

Instructor: R. Cronin

Description: This descriptive approach to the study of developmental biology is helpful toward a better understanding of vertebrate anatomy and thus compliments studies in comparative anatomy and physiology leading to a more complete knowledge of the human body. Though mostly descriptive, the course also embraces the fruits of the experimental approach (which concentrates on cellular controls, behaviour and differentiation) in so far as these help to explain morphogenetic directions and influences of the embryo's evolution.

Gamete formation and maturation, the process of fertilization and the early stages of development of selected invertebrates and prechordates are considered and compared with the same phenomena in selected vertebrates. A methodical analysis of frog development (to hatching) and of chick development (through the fourth day) make up the largest portion of both theory and laboratory, and lay the foundations for the closing study of organogenesis in the human embryo.

Assignments & Grading: Mid-term and final exam plus lab assignments.

Prerequisite: Biology C230.

Campus: Loyola

BIOLOGY C-338
INVERTEBRATE ZOOLOGY (3 credits) Lectures and Laboratory

Instructor: S.M. Ruby

Description: This course will present selected topics of interest in Invertebrate Physiology. It will deal with information and control in invertebrates and will include the in-depth treatment of properties of mechano, chemo and photoreceptors, primitive and advanced nervous systems and endocrine systems in invertebrates. The role of endocrines in regeneration, reproduction and development, moulting and control of colour change will be emphasized in an effort to trace the development of endocrine tissues from primitive to more advanced forms. Other general topics which will be discussed include the principles of hydrostatic skeletons and their modification for use in movement and locomotion, interspecific associations among invertebrates, reproduction and larval development, and bioluminescence.

Assignments & Grading: Laboratory reports will be required with this course. Some basic knowledge of invertebrates is recommended.

Prerequisite: Biology C230.

Campus: Sir George Williams

BIOLOGY C-339
GENERAL PARASITOLOGY (6 credits) Lectures and Laboratory

Instructor: D. McLaughlin

Description: The course material covers the important protozoan, worm and arthropod parasites of man, domestic animals and wildlife. Emphasis will vary from year to year depending upon class interests. Special emphasis will be placed on the biology and life cycles of the parasites, pathogenesis, ecology and behavior of parasites. The relationship between the parasite and the host will be emphasized. The course concludes with a discussion of the evolution of parasitism.

Laboratory. The laboratory collection contains a wide array of parasitic specimens, many of which are rare in university collections. In addition, students will receive instruction in the recovery, preservation and staining of parasitic specimens, techniques used in the recovery of parasite eggs from fecal samples and identification of parasitic worms with taxonomic key books. Several laboratories involve the study of living parasites in experimentally infected animals.

Assignments & Grading: The mark for the course comes from three theory exams, two laboratory exams and the identification of two parasitic worms which are provided after the appropriate groups have been covered in the course. Students may, if desired, present one seminar in March which will count for approximately 50% of the mark on spring final. Such students will answer fewer questions on the spring final. This seminar is optional and any topic must be submitted and approved by January 15. Normally, the theory exams count for 55%, the lab exams 35% and the unknown specimens 10% of the final mark.

Prerequisite: Biology C230 or C334

Campus: Loyola

BIOLOGY C341
BIOLOGY OF THE FUNGI (3 credits) Lectures and Laboratory.

Instructor: P. Widden

Description: This course will trace the history of the subject, the importance of fungi to man and the significance of fungi as ecological agents. The structure, organization, development, nutrition, growth and reproduction of the thallus will be described. The classification of the fungi will be discussed through the study of the structure and life cycles of representative examples. The role of fungi in industrial processes, in the food industry, as pathogens of plants and animals and as agents of decomposition in the ecosystem will be stressed throughout the course. The course will consist of lectures, laboratory sessions in which selected examples of the fungi will be studied and a week-end mushroom foray in which all students will be expected to participate.

Assignments & Grading: Lab reports, mid-term and final examinations.

Prerequisite: Biology C270

Campus: Loyola and Sir George Williams

BIOLOGY C342
NORTH AMERICAN FLORA (3 credits) Lectures and Laboratory.

Instructor: T.B.A.

Description: This course familiarizes the students with the vascular plants: the ferns, their allies and the seed plants of Northeastern North America with an emphasis on the local flora. The history of plant classification and principles of the systems involved will be discussed. Lectures and labs will have methods used in plant identification illustrated with slides and specimens. Work in the field will be included. Students are advised to consult with the instructor before the summer vacation for instructions concerning the required plant collection. It is much easier to assemble the collection during this period rather than during the fall or winter. Its purpose is to introduce plants and their natural habitat to the student and to teach techniques of plant preservation for future studies.

Assignments & Grading: Plant collection, mid-term and final laboratory and lecture examination.

Prerequisite: Biology C240.

Campus: Sir George Williams

BIOLOGY C343
BIOLOGY OF NON-VASCULAR PLANTS (3 credits) Lectures and Laboratory

Instructor: B. Mangat

Description: A course designed to acquaint students with the biology of non-vascular plants. The course will include a brief survey of the classification of algae, fungi, lichens and bryophytes. Other characteristics, such as morphological adaptations to various climates and conditions, anatomical peculiarities, physiological and nutritional requirements will also be considered. By taking common examples, the course will look at the life-cycles and, other features essential to the classification and recognition of members of non-vascular plants. Stress will also be placed on the economic and ecological importance of the non-vascular plants. Skills in preparation, preservation and observation of finer details will be stressed in the laboratory.

Assignments & Grading: The final grade will be distributed among the following:
a) Weekly laboratory reports and lab test(s).
b) Mid-term exam or class test(s).
c) Final written examination.

Prerequisite: Biology C240.

Campus: Loyola and Sir George Williams

BIOLOGY C345
HORTICULTURAL SCIENCE (3 credits) Lectures only.

Instructor: S.S. Ashtakala

Description: The scientific concepts of horticulture are emphasized. The subject material is organized into 3 main categories: Biology of Horticulture, Technology of Horticulture (control of plant growth and development at will) and Topics of Current Interest. These include: Increasing the biological efficiency of crops, use of controlled environments for crop production, breeding plants for temperature, drought and other types of stress (pollutants) tolerance, large scale in vitro and other methods of vegetative propagation, new techniques in plant breeding and production of high-protein plants and production of petroleum plantations for fuel and energy.

Assignments & Grading: Mid-term test, seminar, essay and final examination.

Prerequisite: Biology C240.

Campus: Sir George Williams

BIOLOGY C-347
PLANT ANATOMY (3 credits) Lectures and Laboratory

Instructor: S.S. Ashtakala

Description: The objectives of the course are to present the structure of plants, the origin of tissues and organs, and their ontogeny. The first part of the course deals mainly with the structural specialization of cells and tissues in relation to their functions. These tissues are later treated as components of plant organs such as root, stem, leaf, etc. The basic processes which underlie their growth, development and differentiation are also discussed. Topics include morphological, developmental, pathological, ecological and economic aspects of anatomy as well as its applications in horticulture such as pruning, grafting and healing of the plants.

Laboratory work requires the preparation of permanent slides and free-hand and microtome sections using 4-5 staining schedules.

Assignments & Grading:

Laboratory work:	Lab quizzes	10%
	Lab test	10%
	Weekly lab work and preparation of slides	10%
Mid-term examination		20%
Final examination		50%

Prerequisite: Biology C-240

Campus: Sir George Williams

BIOLOGY C-348
PLANT PHYSIOLOGY (6 credits) Lectures and Laboratory.

Instructor: S.S. Ashtakala, R.K. Ibrahim, B. Mangat

Description: A lecture-laboratory course which deals with the major physiological processes of higher plants as related to nutrition, metabolism and the physiology of growth and development. The course emphasizes the following topics:

- Mineral nutrition, ion uptake and water relations including translocation and transpiration. The principles of plant response to environmental stresses (viz water, temperature, salt and) pollutants will be discussed.
- Detailed study of photosynthesis covering chloroplast structure; photosynthetic pigments and the light reactions; CO_2 fixation patterns in different plants and the formation of other carbon intermediates; factors affecting photosynthesis and methods used for its measurement.
- Respiration and fermentation; electron transport, energy output and the ATP cycle; methods used to determine respiration and factors affecting the process.
- Plant metabolism involving carbohydrates, lipids and organic nitrogen compounds with emphasis on the role of intermediates in other synthetic processes.
- Definition of plant growth and its measurement; review of the discovery and biochemistry of plant hormones including auxins, gibberellins, cytokinins and the growth inhibitors, abscisic acid and ethylene.
- Hormones and regulation of growth and development: growth correlations, differentiation and organization, dormancy, abscission and senescence.
- Metabolic responses and approach to the mode of action of hormones through their effect on nucleic acid metabolism.
- Photomorphogenesis; phytochrome and photoperiodic control of flowering.
- Laboratory experiments are chosen to demonstrate the most important physiological phenomena described above.

Assignments & Grading: Laboratory reports, mid-term tests and final examination at end of each term.

Prerequisite: Biology C240

Campus: Sir George Williams and Loyola.

BIOLOGY C-351
FIELD AND LABORATORY ECOLOGY (3 credits) Field Trip and Laboratory.

Instructor: R.S. Anderson

Description: This course is an introduction to quantitative and qualitative studies of aquatic and terrestrial habitats. The emphasis on different habitats may vary from year to year.

There will be some week-end field trips in addition to week-day field studies, and there will be a substantial laboratory component. Topics covered may include vegetative analysis, vegetative and soil invertebrate sampling, quantitative and qualitative studies of aquatic organisms, the measurement of physical and chemical variables, and aspects of species distribution, abundance and diversity. Students will be expected to become familiar with the basic sampling equipment and techniques used in the field. In the laboratory, basic techniques of sampling processing, specimen care and identification and data analysis will be covered. There may be an independent project, the nature of which may vary from year to year.

Assignments & Grading: Assignments are variable, but will include reports or presentations on field and laboratory studies. There will be an examination. Final grades will be based on field and laboratory participation, reports and assignments, and the examination. This is a three-credit course over two semesters. Most field work will be done in the first term.

Prerequisite: Biology C250; Biology C222 and C230 are strongly recommended.

Campus: Sir George Williams

BIOLOGY C-352
PLANT FIELD ECOLOGY (3 credits) Field Trip and Laboratory.

Instructor: P. Widden

Description: This course is normally offered during the last two weeks of August at the Lacolle Centre. Students are expected to live at the centre for the entire 2-week period. The course will involve the identification of local plant species and the collection and preservation of specimens. The use of relevée analysis, quadrat sampling, line and belt transects and vegetation mapping methods in describing plant communities will be demonstrated. The application of statistical methods to quantitative data on species populations will also be discussed. The course will consist of formal lectures, informal discussion groups, organised field work, individual projects, and an excursion into the Adirondacks to look at plant communities in the mountains.

Assignments & Grading: Students will be required to hand in a written report and a pressed plant collection on completion of the course.

Prerequisite: Biology C240.

Campus: Loyola (Lacolle Centre)

BIOLOGY C-353
INTERMEDIATE ECOLOGY (3 credits) Lectures only.

Instructor: E. Maly, P. Widden

Description: An in-depth analysis of factors affecting distribution and abundance of plants and animals. A major section of the course concerns morphological, physiological and behavioural adaptations of individuals to various physical environments: desert, arctic, and high altitude. Also, daily (circadian) rhythms and their adaptive significance are discussed. A second major section of the course concerns population structures and animal reproductive strategies, behaviour of populations are also discussed.

This course expands upon topics introduced in Biology C250 and illustrates the dependence of ecology on physiology and animal behaviour.

Assignments & Grading: A major part of the grade in this course is based upon a term-paper on some topic of the student's choice.

Prerequisite: Biology C250.

Campus: Loyola and Sir George Williams.

BIOLOGY C-355
FUNDAMENTALS OF LIMNOLOGY (3 credits) Lectures only.

Instructor: G. Leduc

Description: An introduction to the study of freshwater ecosystems with major emphasis on geographical, physical and chemical characteristics. The major topics include the origin of lake basin, lake morphology and morphometry, waves and currents, the optical and thermal properties of lakes.

With regard to the chemistry of lakes, attention is given to the distribution of oxygen, CO_2 and other common nutrients. A major emphasis is given to cultural eutrophication analyzing in depth the interrelation of physical, chemical and biological factors leading to the evolutional lake ecosystems.

Assignments & Grading: Evaluation of students is based on take-home assignments, mid-term and final examinations.

Prerequisite: Biology C250 previously or concurrently.

Campus: Sir George Williams.

BIOLOGY C-356
MICROBIAL ECOLOGY (3 credits) Lectures and Laboratories.

Instructor: P. Widden

Description: The course is designed to give an understanding of the environments in which microbes live, the structure and organisation of microbial communities and the interactions between different groups of microorganisms. Topics discussed will include the structure of soils, water relations, nutrient supply, the role of microorganisms in the degradation of organic substances, nutrient cycling, microbial symbioses, parasitism and predation, microbial succession and the relative contributions of different taxonomic groups to the decomposition process. The major stress will be on terrestrial organisms, but some time will be devoted to the discussion of aquatic systems. The course will consist of lectures, student seminars, informal discussion and an integrated laboratory project.

Assignments & Grading: T.B.A.

Prerequisite: Biology C270.

Campus: Loyola.

BIOLOGY C-360
GENERAL GENETICS (6 credits) Lectures and Laboratories.

Instructor: C. Beckman

Description: The laboratory first semester consists of classical fly crosses which parallel and illustrate the theory which the student learns in lecture. The second semster laboratory consists of more varied work with Drosophila, bacteria and molds. Laboratory work may require more than 3 hours of the student's time some weeks and less in others.

Assignments & Grading: Students submit approximately 10 written lab reports. Three written class tests are given. In addition, there is an optional take-home test, and the usual Christmas and final examinations.

Prerequisite: Biology C230 and C240.

Campus: Loyola

BIOLOGY C-361
CELLULAR METABOLISM I (3 credits) Lectures only.

Instructor: B. Mangat

Description: This is an intermediate level course designed to acquaint the student with cellular biochemistry and physiology. An advanced knowledge of chemistry is not necessary in order to understand the majority of the topics discussed. The course starts with a very brief introduction to the chemistry of biological material and the importance of pH and buffers in cell systems before proceeding to deal with the following topics:

- The functional organization of the cell, emphasis being placed on the morphology of cells and their organelles; the structure and function of membranes, particularly their role in transport.
- The dynamics and energetics of biochemical systems which include a basic study of enzymes, their mode of action and energy conversion in cells.
- The production and utilization of energy. The topics discussed here include the metabolism of carbohydrates, lipids and organic nitrogen compounds with emphasis on the role of intermediates in various synthetic processes. Oxidative and photophorylation and CO_2 fixation patterns in different plants. Nitrogen and sulfur cycles.
- Metabolism of informational molecules and protein synthesis.

Assignments & Grading: Two class tests and a final examination. Distribution of marks to be discussed in the first lecture.

Prerequisite: Chemistry C231 and C232.

Campus: Loyola.

BIOLOGY C362
CELLULAR METABOLISM II (3 credits) Lectures and Laboratory.

Instructor: B. Mangat

Description: This course is designed to follow Biology C361 and further exposes the student to the pattern and purpose of cellular activity. The course examines in detail some of the topics discussed in Biology C361, in particular the methods for studying intermediary metabolism, preparation and purification of enzymes and their mode of action. Emphasis is also placed on the regulation of metabolic activity exercised by the cell and organisms through various means. The student is also introduced to other topics which include: (a) Nucleotides and their importance in intermediary metabolism and the role of sugar nucleotides in cell-wall synthesis of plants; (b) nutritional requirement of organisms and the importance of vitamins and cofactors in cellular activity.

In order to understand the effect of pollutants on metabolism, a brief discussion on cellular aspects of pollution is included at the end of the course.

Laboratory experiments will be chosen to demonstrate the most important aspects of the topics described above.

Assignments & Grading: The final grade will be distributed among the following:

a) Weekly laboratory reports.
b) Mid-term exam or class test(s).
c) Final written examination.

Prerequisite: Biology C361.

Campus: Loyola.

BIOLOGY C-363
GENETICS OF HIGHER ORGANISMS (3 credits) Lectures only

Instructor: T.B.A.

Description: The aim of this course is to study in some detail the theoretical and practical principles of genetics and how these apply to the study of human genetic variation.

The first part of this course will include cytogenetics:- chromosomal abnormalities and how these relate to human syndromes.

Somatic cell genetics has been a major tool for unraveling the mysteries of many inherited disorders in man and in mapping of the human genome. Thus we will study this technique and its application in this area of research.

We will then consider how genes control protein structure and function. In particular how this applies to the various haemoglobin diseases. This is an area in human genetics which as been thoroughly investigated.

Certain inborn errors of metabolism will be studied in detail. These will include enzyme as well as structural protein defects. Where possible treatment and management of these diseases will be considered. The role of genetic counselling, prenatal diagnosis and screening programs (especially as these apply to Quebec) will be studied.

Other broad themes to be considered will include multifactoral inheritance, pharmacogenetics and the genetics of cancer.

Assignments & Grading: 80% of the final grade will be based on the mid-term and final exam. These will be made up of essay and short answer questions. The other 20% will be based on a term paper. The emphasis here is on depth rather than breadth. For this the student will be required to obtain information from scientific journals.

Prerequisite: Biology C-260. A knowledge of biochemistry would be an asset but is not essential for this course.

Campus: Sir George Williams

BIOLOGY C-364
CELL PHYSIOLOGY (3 credits) Lectures and Laboratory

Instructors: J.A.Kornblatt

Description: A course in which cellular function and cellular response to the envrionment are surveyed. The course concentrates on, i. assembly of biological structures. ii. biological membranes, their structure and permeability properties, iii. transport across biological membranes, transport and nerve function, transport and muscle function, iv. biological energy production, mitochondrial "ox-phos" chloroplast-photophosphorylation, bacterial systems, the proton pumps of all cells, v. homeostasis - how the various membrane relatedsystems provide a framework for the smooth functioning of the cell during the periods of plenty or during stress. Lectures and laboratory.

Assignments & Grading: Laboratory quizzes and/or lab reports. Mid-term and final exam.

Prerequisite: Biology C230 and C240, Chemistry C221 and C222.

Campus: Sir George Williams

BIOLOGY C-365
CYTOLOGY (3 credits) Lectures and Laboratory

Instructor: R.Cronin or H.Enesco

Description: Using a descriptive and comparative approach to study cell anatomy and physiology, this course is designed to acquaint the biology or biochemistry major in particular, with the fundamentals of living organization and activities in plant and animal cells.

Our objective will be to reach an understanding of the correlation between structure and function in plant and and animal cells, based on electron microscopic, cytochemical and biochemical analysis. Chromosome structure is cell organelles, including lysosomes, Golgi apparatus, mitochondria, chloroplasts, ribosomes and membranes are analyzed in relation to the functional activitied of the cell.

While the laboratory is devoted to the preparation, observation, measurement and comparison of cells and cell products at light microscope levels, the lectures concentrate upon features and functions revealed by the electron microscope and biochemical and molecular methods of analyses. Cell division, differentiation, intercommunication as well as other vital processes are considered. Finally, time permitting, specialized animal cells (gametes, muscle, nerve, etc.) are examined in some detail.

Assignments & Grading: Regular laboratory reports are required. Mid term and final exam.

Prerequisite: Biology C230 and C240, Chemistry C221 and C222

Campus: Loyola and Sir George Williams

BIOLOGY C-370
INTERMEDIATE MICROBIOLOGY (3 credits) Lectures and Laboratory

Instructor: R. Germinario and S.N. Sehgal

Loyola Campus
Description: This course in applied and industrial microbiology is designed to follow Biology C-270. Topics covered will will include the genetics of microorganisms, the molecular basis of mutation, nutrition and metabolism of of micro-organisms (specialized fermentations and oxidative reactions as energy yielding systems). The importance of microbes in medicine and industry will be presented. Other topics may include basics of immunobiology and immunochemistry. The laboratory will include experiments on bacterial mutant isolation, extensive use of various biochemical tests in addition to serologic methods of identifying micro-organisms, the kinetics of antibody formation and other serologic methods.

Assignments & Grading: Final grades will be determined by written lab reports, a final lab examination and a mid-term and final lecture examination.

S.G.W.
Description: This course is designed to follow Biology C270 and will deal primarily with applied and environmental microbiology. The topics covered wil include fermentation and its industrial development; secondary metabolism (antibiotic fermentation); primarily metabolites and use of microorganisms in synthetic chemistry. The topics covered will also include genetics of industrial microorganisms, analytical microbiology and sterilization techniques. The laboratory will include experiments on isolation of antibiotic producing microorganisms from soil, production, isolation and purification of antibiotics and bioconversion of organic compounds.

Prerequisite: Biology C270 and Chemistry C221 and C222. Recommended as a prerequisite - Chemistry C371 or Biology C361.

Campus: Loyola and Sir George Williams

BIOLOGY C-380
NUTRITION (3 credits) Lectures only

Instructors: T.B.A.

Description: This course provides an introduction to the science of nutrition through the study of the metabolism, utilization, and functions of all essential nutrients: proteins, lipids, carbohydrates, vitamins, minerals, fiber and water. Nutritional needs throughout the life cycle are studied and some of the methods available to evaluate the nutritional status of individuals are reviewed. The influence of environmental factors on nutrient intake is discussed, and the consequences of dietary deficiencies are examined.

Assignments & Grading: Mid-term and/or essay and final exam

Prerequisite: Chemistry C221 and C222 (organic Chemistry) Biochemistry or equivalent recommended

Campus: Loyola and Sir George Williams

BIOLOGY C-420
RADIATION BIOLOGY AND RADIOTRACER METHODOLOGY I (3 credits) Lectures and Laboratory.

Instructor: R.M. Roy

Description: This course attempts to provide students in the biological sciences with a basic understanding of the properties of ionizing radiation and its interaction with matter. The production and characteristics of X-rays and techniques of detecting radiation or measuring radiation dose are discussed in detail. The theoretical background and the practical techniques of utilizing the following detectors is presented: geiger counter, gas-flow proportional counter, solid and liquid scintillation counter. The procedures for handling isotopoes and isotopically labelled compounds are discussed.

The effects of ionizing radiation on water and free radical production will be considered. The biological effects of ionizing radiation at the biochemical, cellular, organismal and ecological level will be discussed in detail. Special emphasis will be given to carcinogenic and the mutagenic effects of radiation in man.

Laboratories will illustrate the properties of ionizing radiation, operation of X-ray equipment, measurement of radiation dose and operation of various types of counters. Two projects are normally carried out illustrating the somatic and mutagenic effects of ionizing radiation.

Assignments & Grading: Grades are largely based on lab reports (70%) and a essay-type final exam.

Prerequisite: Biology C260 and C364.

Campus: Sir George Williams.

BIOLOGY C421
RADIATION BIOLOGY AND RADIOTRACER METHODOLOGY II (3 credits)
Lectures and Laboratory

Instructor: R.M. Roy

Description: This course is designed to follow Biology C420 and considers in detail several selected topics in lectures: chemical and solid-state dosimetry; liquid scintillation counting; molecular radiation biology (DNA repair); modifying factors of radiation damage; medical applications of radiation and isotopes; ultraviolet and microwave radiation. Students are expected to present a seminar and participate in class discussions.

The laboratory exercises provide practical experience in liquid scintillation counting (quench correlation, dual label, Cerenkov counting), chemical dosimetry, autoradiography, and handling a wide range of isotopes and isotopically labelled compounds (^{3}H, ^{14}C, ^{22}Na, ^{32}P, ^{45}Ca, ^{59}Fe, ^{85}Sr, ^{86}Rb, ^{131}I).

An optional visit to Atomic Energy of Canada's Chalk River Nuclear Laboratories is normally arranged.

Assignments & Grading: Grades are largely based on laboratory work and class participation (70%) and an essay (30%).

Prerequisite: Biology C420.

Campus: Sir George Williams.

BIOLOGY C-431
BIOLOGY OF FISHES (3 credits) Lectures and Laboratories.

Instructor: G. Leduc

Description: An introduction to the diversity of fishes, with emphasis on the freshwater fishes of North-Eastern part of North America. Generic, physiological, ecological and morphological aspects of living fishes are discussed in lectures and examined in labs with the intent of providing students with basic information for fisheries management and ecotoxicological research.

Laboratory work includes general anatomy, identification of local species and a term project with live fish or museum collection.

Assignments & Grading: Students may be required to present a seminar on a topic of interest and/or a term paper. There are lab assignments and a final examination. The grading scheme is established in consultation with students.

Prerequisite: Biology C330 or C331.

Campus: Sir George Williams and Loyola.

Text: Biology of Fishes. C.E. Bond. W.B. Saunders, 1979.

BIOLOGY C432
MICROSCOPICAL TECHNIQUES (3 credits) Lectures and Laboratory.

Instructor: K.S. Dhindsa

Description: This course deals with modern histological/histochemical techniques used in the study and preparation of animal tissues. The lectures and laboratories deal with the theory and techniques of: fixation of staining and sectioning, interpretation. Interpretation and identification of the cell organelles, organic constituents of cells (nucleic acids - RNA, DNA; proteins, carbohydrates, lipids...) with specific staining methods will be discussed and illustrated as well as techniques of autoradiography and principles of photomicroscopy. The students work in teams and are expected to submit a complete report of the methods followed along with photomicrographs of the tissues prepared. Periodic progress reports of the work carried out are also submitted.

Assignments & Grading: Grades are compiled on the basis of reports, assignments and the manual dexterity/precision, demonstrated in the techniques carried out.

Prerequisite: Biology C335; Biology C336 is strongly recommended previously or concurrently.

Campus: Loyola.

BIOLOGY C433
NEUROBIOLOGY (6 credits) Lectures and Laboratory

Instructor: S.P. Drummond

Description: This course is offered for those students with a background knowledge of vertebrate anatomy, who wish to pursue in greater depth the nervous system, with special emphasis on the human nervous system.

The first semester opens with a discussion of the embryology and gross anatomy of the central and peripheral nervous systems. Detailed study will be made of the neuron, the affectors and effectors. The laboratory work will include the dissection and appropriate microscopic study of the nervous system and sense organs in the shark.

The second semester will be devoted to a detailed study of the mammalian neurological pathways: a) the afferent system, b) the efferent system, c) the association system. The course will include discussions of: a) reflex behaviour, b) the learning process, c) the nervous system and intellect, d) emotions and the limbic system, e) abnormal and pathological problems. Laboratory work will include dissections of the mammalian brain, demonstrations of human dissections, microscopic study of selected mammalian and human material.

The nervous system not only exercises a primary controlling function over all the other systems of the body, but also subserves the intellectual activity of the human mind. As a result, this course can lead to some degree of personal enlightenment and development. Human behaviour is multi-faceted. Pragmatically, the course should appeal to anyone whose interests lie in the fields of behaviour, learning, teaching and communication.

Assignments & Grading: To be arranged with the participants in the course.

Prerequisite: Biology C330 or C331.

Campus: Loyola.

BIOLOGY C-434
COMPARATIVE AND ENVIRONMENTAL PHYSIOLOGY (6 credits) Lectures and Laboratory.

Instructor: N.N. Kapoor

Description: A good background in vertebrate, invertebrate zoology and general animal physiology is essential for the understanding of material covered in the course. Primary objective of the course is to discuss physiological responses of animals to natural changes or extremes of the physical environment. A comparative study of physiological processes in diverse phyla is organized on a function - system basis, and deals with behaviour and physiological adaptations in animals. Lectures, seminars and laboratory.

Labs are project type and require group study. The emphasis is on special techniques to perform laboratory investigations.

Assignments & Grading: Grades are based on seminars, essays, lab reports, mid-term and final examination. A student is required to prepare a selected topic for seminar and submit a written essay (10-15 pages) in each term. The oral examination is followed by general discussion and comments. The participation of the whole class is expected.

Prerequisite: Biology C333, C362 or Chemistry C371 (General Biochemistry).

Campus: Loyola

BIOLOGY C-441
PLANT BIOCHEMISTRY (3 credits) Lectures only.

Instructor: R.K. Ibrahim

Description: A lecture course dealing with the biochemistry of natural constituents unique to plants with emphasis on secondary metabolites; their biosynthetic origin and transformations; their raison d'être, enzymology and functional significance.

The course starts with a review of the metabolic activities of plant cells and the role(s) of intermediate metabolites in the biosynthesis of natural plant products, then proceeds to deal with the following topics:

- Cellulose, hemicellulose and pectins; their assembly and mechanism of cell wall growth; algal cell wall polysaccharides and gel-forming substances.
- Origin of aromatic rings in plants; review of plant phenolic compounds including phenylpropanoids, lignins, tannins, flavonoids and cyanic pigments; enzymes and regulation of phenolic metabolism.
- Biosynthesis of terpenoid compounds; variety and role of volatile oils, abscisic acid, gibberellins, sterols, cardiac glycosides, carotenoids and rubber.
- Nitrogen metabolism and origin of alkaloids; review of the most important groups of alkaloids with reference to their economic and pharmacologic significance.
- Plant tissue and cell cultures and its potential in the production of secondary plant products and biotransformation studies.

Assignments & Grading: Final grade is divided among the following: Two - three assignments, and a final examination.

Prerequisite: Biology C348 or Chemistry C371 or Biology C361 and C362.

Campus: Sir George Williams.

BIOLOGY C442
PLANT RESPONSES TO ENVIRONMENTAL STRESSES (3 credits) Lectures only.

Instructor: S.S. Ashtakala or B. Mangat.

Description: This course is offered for those students with a background knowledge of plant physiology who wish to pursue in greater depth the responses of plants to environmental stresses. The course starts with a brief discussion of the biotic and abiotic environment of the plant before looking at the physiological and molecular basis of plant response to various environmental stresses. The type of stresses a plant may be exposed to include air pollutants and radiation. The course deals with the nature of stress injury and studies the control of such stresses including the resistance, tolerance and avoidance mechanisms exercised by the plant. The course will consist of lectures, seminars, tutorials and individual projects.

Assignments & Grading: Evaluation will be based on a project paper, seminar performance, a mid-term and a final examination. Distribution of the marks will be discussed at the beginning of the course.

Prerequisite: Biology C240.

Campus: Loyola and Sir George Williams

BIOLOGY C450
AQUATIC ECOLOGY AND WATER POLLUTION (3 credits) Lectures only

Instructor: G.Leduc

Description: An inquiry into factors governing the distribution and abundance of aquatic organisms in lakes and streams, with emphasis on the nature and significance of responses of aquatic organisms and communities through changes in water quality with pollution.

The study of water pollution is given an ecosystem approach in evaluating the impact of various kinds of pollutants on different aquatic organisms.

The main topics include physical factors of pollution such as thermal discharges, alteration of current, sillation, dredging and damming of streams. A major emphasis is given to chemical pollution with basic principles of toxicology: mode of action, response and bioassays and study of representative industrial, agricultural toxicants (heavy metals, pesticides, cyanides, acid rain, etc.)

Assignments & Grading: Evaluation of students is usually based on final exam and a term paper.

Prerequisite: Biology C355

Campus: Sir George Williams

BIOLOGY C454
POPULATION ECOLOGY (3 credits) Lectures only

Instructor: E.Maly or R.S. Anderson

Description: A theoretical approach to ecological problems. This is an advanced course designed to acquaint students with ecological studies that contain a large element of theory. Topics may vary in different years but will include most of the following: evolutionary aspects of ecological problems, population dynamics, species diversity, stability of ecosystems, regulation of population size, resource partitioning (competition and its avoidance) predation, island biogeography, and succession

Many aspects of the topics discussed do not yet have substantial field or laboratory documentation; the class will attempt to outline possible procedures for obtaining evidence.

Assignments & Grading: Reading assignments will be from original literature Students may be assigned problems, and it is expected that students will have some working knowledge of CEGEP-level calculus courses.

Campus: Sir George Williams

BIOLOGY C460
MOLECULAR GENETICS (3 credits) Lectures only.

Instructor: M.B. Herrington

Description: Microbial genetics and two other topics chosen from the following will be discussed: biosynthesis of DNA, molecular mechanism of recombination, genetic suppression, and protein synthesis. The emphasis in this course will be to develop an understanding of the theoretical framework and experimental approaches of molecular genetics. In particular, we will discuss the isolation of specific kinds of mutants, their characterization by genetic, biochemical and physiological techniques and the information derived from such studies. No textbook is required, and a list of recommended reference books and original journal articles will be provided.

Assignments & Grading: Course work will include problems, termpaper(s) and examinations.

Prerequisite: Biology C260 or C360 and Chemistry C371 (Biochemistry) previously or concurrently, or permission of the instructor.

Campus: Sir George Williams.

BIOLOGY C-461
ADVANCED GENETICS (3 credits) Lectures and Seminars.

Instructor: C. Beckman

Description: Students are required to read a book which deals with modern genetics, and they are asked to give two to three oral presentations of material that they have learned from reading journals. To a certain extent, the content of the course depends upon the interests of the partcipants.

Assignments & Grading: A term-paper is required. There is a take-home final with essay questions in this course.

Prerequisite: Biology C260 or C360.

Campus: Loyola.

BIOLOGY C-462
IMMUNOLOGY (3 credits) Lectures and Conferences

Instructor: J.A. Kornblatt

Description: A course in modern immunology stressing the following areas of study: the structure and properties of antigens and antibodies; the nature of the immune response; cellular antibody synthesis; genetic aspects of antibody synthesis; theories relating antibody specificity to genetic potential.

Assignments & Grading: Essay and final examination.

Prerequisite: Biology C364, C260 or C360, Chemistry C371 (Biochemistry) previously or concurrently.

Campus: Sir George Williams

BIOLOGY C-463
DEVELOPMENTAL BIOLOGY (3 credits) Lectures only.

Instructor: H. Enesco

Description: In this course, our objective is to gain an understanding of the mechanisms controlling the differentiation of cells and the development of organisms. We begin by examining the processes by which the germ cells and the embryo develop. Topics include gametogenesis, fertilization, cleavage and gastrulation. We proceed to consider cell interactions and molecular events in development. Embryonic induction, cell sorting, tissue assembly, control of cell growth, and gene control of cell differentiation will be examined.

We will further explore, as time permits, the biological bases of cancer cell differentiation, of metamorphosis and of regeneration.

Assignments & Grading: Short term papers are required. Seminars may be required.

Prerequisite: Biology C364, C260 or C360; Biology C237 or C337 is recommended.

Campus: Sir George Williams.

BIOLOGY C-464
ADVANCED CELL PHYSIOLOGY (3 credits) Lectures only

Instructor: R. Germinario

Description: A course in which an attempt is made to discuss current topics in cell biology and biochemistry. Methods of *in vitro* culture of animal and human cells are presented. Other subjects covered include detailed discussions of: the biochemistry of the cell cycle, the cell surface, factors involved in the control of cell replication, mechanisms of peptide and steroid hormone action, cell hybridization techniques and applications in the study of the control of gene expression.

Assignments & Grading: Essay and final examination.

Prerequisite:

Campus: Sir George Williams

BIOLOGY C-465
BIOLOGICAL REGULATORY MECHANISMS (3 credits) Lectures and Conferences

Instructor: E.B. Newman

Description: A survey of methods used by cells to control the rates of biochemical reactions. Cells are rarely wasteful - products they make are made in just the amounts needed. The cell can respond rapidly to changes in its environment, ceasing to make compounds which are suddenly supplied to it - or starting to make others as called for.

The controls on enzymatic reactions which allow this efficiency are surveyed in this course. Effects on enzyme activity (feedback inhibitions, enzyme-catalyzed enzyme modification, induction, etc.) - among others - are considered.

The emphasis of this course is on the logic of scientific experimentation. The course discusses the experimental evidence on which concepts of enzyme regulation are based, which experiments are likely to give answers, how ideas in the field have developed.

Assignments & Grading: Exams consist largely of experimental results from the literature which students are asked to analyze. Students are also asked to do reports on three papers from the current literature.

Prerequisite: An understanding of biochemistry is a great asset in this course. Biochemistry should be taken previously or concurrently.

Campus: Sir George Williams

BIOLOGY C-467
CYTOGENETICS (3 credits) Lectures and Laboratory.

Instructor: R. Cronin

Description: Designed to complement courses in cell biology and genetics, this course may be described as a concentrated examination of chromosomes, both plant and animal, as to their structures, numbers and behaviour, whether normal or abnormal, as well as their roles in species maintenance and diversification. Examples from horticulture, agronomy, agriculture and veterinary and human medicine are studied for an understanding of inheritance of defects and benefits of organisms, their productivity and species stability.

The laboratory is devoted to acquiring skills in the techniques of preparation and examination of representative plant and animal chromosomes.

Assignments & Grading: Final mark is based upon practical lab work and lecture theory (Final examination).

Prerequisite: Biology C365 and C260 or C360 or permission of the instructor.

Campus: Loyola.

BIOLOGY C-470
MICROBIAL PHYSIOLOGY (3 credits) Lectures only.

Instructor: E.B. Newman

Description: A survey of the diverse ways in which microorganisms derive energy and build cell constituents. How does an organism like Thiobacillus thiooxidans survive at pH 1 and derive energy from oxidizing sulfur? Is its metabolism fundamentally different from that of E. coli which lives in an animal intestine at 37°C from B. stearothermophilus which carries out its metabolic affairs at 55°C, or a methane bacterium that won't grow at all if any oxygen is present?

The course surveys the biochemistry of energy-yielding reactions, compares pathways in similar and diverse organisms, and considers metabolic balance sheets. In addition, an attempt is made to understand the ecological niche of organisms in terms of their biochemistry - i.e., in what ways are organisms diverse. On the other hand an attempt is made to derive some general principles of the biochemical requirements for microbial life by finding the similarities in diverse organisms.

Assignments & Grading: To be arranged with participants in the course.

Prerequisite: An understanding of biochemistry is essential for this course.

Campus: Sir George Williams.

BIOLOGY C-490
INDEPENDENT STUDY (6 credits)

Instructor: P.D. Anderson and N.N. Kapoor.

Description: This program provides an opportunity for 3rd year Honours students (and other 3rd year students with special permission of the Chairman or Co-ordinator) to conduct independent laboratory and literature research on a topic of special interest. This course is particularly suited for students who are considering a career in research for the forum test one's ability to think creatively and critically, to appreciate and develop concepts, to acquire indepth knowledge, to analyse and solve problems, and to conduct laboratory projects in Biology with skill.

Assignments & Grading: Third Year Honours standing or 3rd year standing in Biology with special permission of the Chairman/Co-ordinator. Students must obtain an agreement from a Biology professor to supervise his or her project. Students are advised to make these arrangements and to notify the program's Co-ordinators before the end of spring term of their second year.

Prerequisite: 3rd Year Honours Standing. Students with high academic standing in 3rd year Biology Specialization programme may be granted permission to take this course.

Campus: Sir George Williams and Loyola.